Serial No. - 09/925,059
Art Unit - 2878

REMARKS

Claims 4-6, 9, 10, 14-16, 28-33, and 37-43 are pending in the present application. Claims 41-43 are the only pending independent claims.

Regarding the objections to the drawings, reference number 124D has been removed from the description. The "viewing device" identified in the Office Action has been described in the specification as originally filed with reference to Fig. 1A (see page 25, lines 5-13):

> "As best illustrated in Fig. 1A, the display device 102D is designed to not interfere with operator/wearer's normal line of vision, however the optics and viewing window 148 can be viewed by looking upwards."

The objections to the claims have been remedied by appropriate amendment. Applicant thanks the Examiner for his close attention to these matters.

Regarding the rejection of the claims under 35 U.S.C. §112, applicant notes that claim 27 has been canceled, claims 14 and 37-40 have been amended, and claim 41 is discussed below.

Claim 41 has been rejected for its recitation of "a composite lens free of crystal germanium." As was noted in the previous response, support for this language of claim 41 can be found on page 13 of the original specification. Specifically, although the specification does not use the words "free of crystal germanium," the description of the lens composition begins on page 13, lines 4-6, with a discussion of the negative characteristics of crystal germanium. The description then sets out to contrast the lens composition of the present invention from an objective lens fabricated from crystal germanium. The following excerpts taken from pages 13 and 14 of the specification further illustrate this point:

> "[A] **typical** LWIR sensor uses a transparent objective lens fabricated from crystal germanium (Ge) that cannot pass radiation in the NIR spectral range. The objective lens

> 124A however, has a broad spectrum that is **transmissive to** VIS and **NIR** as well as LWIR spectral ranges." See page 13, lines 4-9. Emphasis added.
>
> "The preferred composite construction of the objective lens 124A (ZnSe - $Ge_{33}As_{12}Se_{55}$ - ZnSe) solves many problems associated with a **typical** Ge lens." See page 14, lines 6-7.

The objective lens of the present invention is described as being "transmissive to the NIR spectral range" while "typical" Ge lenses, which include crystal Ge, are described as being unable to "pass radiation in the NIR spectral range." Accordingly, the objective lens of the present invention is clearly contrasted with the "typical" Ge lens that includes crystal germanium. Accordingly, applicant respectfully submits that a comprehensive reading of the present specification, particularly pages 13 and 14, makes it clear that the lens composition of the present invention represents a clear departure from "typical Ge" lenses, which include crystal germanium. As such, claim 41 has not been amended to remove the "free of crystal germanium" recitation.

Turning now to the recitations of independent claim 42 under 35 U.S.C. §103, applicants note that the art previously cited against independent claim 36 fails to teach or suggest the conversion of the respective visible and infrared images taken through a common optical aperture to a consistent pixel and size format. The Office Action relies upon the teachings of the Yona et al. patent to support the assertion that this type of conversion would have been obvious in view of the prior art. However, applicants note that the Yona et al. reference merely teaches that images taken from two separate image sources, with separate optical apertures, may be "combined pixel by pixel to one digital image." Neither the Yona et al. reference nor any of the other cited references recognize the challenges associated with the common optical aperture configuration of the present invention. As a result, none of the cited references recognize the need for the electronic image fusion circuitry of the present invention, where the first and second image outputs

from the first and second sensors sharing the common optical aperture are converted to a consistent pixel and size format.

Each of the cited references fall short of teaching or suggesting the present invention because they fail to disclose a system including: (i) a common optical aperture for both spectral bands; (ii) a beam splitter for separating the different spectral bands; and (iii) first and second sensors sharing a common optical aperture for the respective spectral bands; and (iv) electronic image fusion circuitry for processing outputs from the respective sensors by converting respective visible and infrared images represented by the first and second outputs to a consistent pixel and size format such that pixel-by-pixel data fusion is realized at the display device.

The common optical aperture enables processing of the two separate spectral bands to get the same image from the same target without parallax. The beam splitter separates the two bands into two channels, i.e., the visible channel (0.4 – 0.8 μ) and the long infrared channel (8 - 12 μ). The two separate sensors define two focal plane arrays - one detects the visible image and the other detects the infrared image. These aspects of the design enable optical alignment of the two images from the same target without using an electronic circuit. However, for proper pixel by pixel fusion suitable electronic circuitry is required because the two focal plane arrays have different pixel sizes, pitches, and numbers. The recited electronic image fusion circuitry of the present invention can scale, interpolate, and reformat the focal plane array of the first sensor such that it has the same pixel size, pitch and number as the focal plane array of the second sensor. As is recited in claims 37-40, additional circuitry may be provided to enable pixel-by-pixel addition, subtraction, convolution, and enhancement.

Turning finally to the recitations of new independent claim 43, the present invention also relates to the use of aberration correcting lenses in each image channel to allow for optically correcting aberrations and scaling images so that correct overlap of images can be achieved. For example, referring to the paragraph bridging pages 16 and 17 of the present application, because the NIR and LWIR signals are processed independently through lenses 115 and 117 respectively, different materials can be used to correct aberrations within the limited bandwidths. That is, instead of attempting to

correct aberrations across the entire 0.48 to 12 μ waveband, only the aberrations in the 0.48μ to 0.9μ waveband are corrected for the NIR sensor 116, and only aberrations in the 8μ to 12μ waveband are corrected for the LWIR sensor 118. This increases flexibility in selecting suitable materials and correcting aberrations. Applicant respectfully submits that none of the cited references teach or suggest the configuration recited in claim 43.

CONCLUSION

Applicants respectfully submit that the present application is in condition for allowance. The Examiner is encouraged to contact the undersigned to resolve efficiently any formal matters or to discuss any aspects of the application or of this response. Otherwise, early notification of allowable subject matter is respectfully solicited.

Respectfully submitted,

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